Effects of molasses-based blocks on Highland cattle grazing in green alder-encroached pastures

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Introduction: Over the last decades, European mountain areas have been subjected to a decrease of agro-pastoral activities, leading to landscape modifications with reforestation processes over former pastures. Green alder (*Alnus viridis*) is a pioneer species that has expanded due to land abandonment, leading to several negative agro-environmental impacts, such as a reduction in biodiversity and an increase in nitrate leaching. Robust livestock breeds able to digest green alder leaves, such as Highland cattle, could be used to reduce green alder expansion. The objectives of this study were to assess i) the spatial distribution of Highland cattle in green alder-encroached pastures, ii) the ability of attractive points to increase the exploitation of encroached areas by livestock, and iii) the short-term impacts on vegetation.

Materials and methods: During the summers of 2019 and 2020, two Highland cattle herds were placed in three paddocks along a green alder encroachment gradient in the Swiss and Italian Alps. Six to ten cows in each herd were equipped with GPS collars. In 2019, 58 botanical surveys were carried out before grazing to assess plant community composition, pastoral value (Pittarello et al., 2018) and ecological indicator values of the vegetation of each paddock. Cattle spatial distribution was studied throughout the season to assess the relationship with topographic and vegetation characteristics. During the summer of 2020, attractive points (molasses-based blocks) were added in highly green alder-encroached areas of each paddock to attract the herds. Botanical surveys were carried out before and after grazing along 10-m transects around both molasses-based blocks and paired control areas to assess the role of attractive points in increasing grazing pressure on green alder-encroached vegetation. Moreover, livestock exploitation of 50-m buffer areas around attractive and control points was assessed in 2020 and then compared to 2019.

Results: In 2019, Highland cattle were able to move to the most unfavorable areas of the paddocks, as they were able to graze on green alder-encroached areas, as well as on the steepest slopes and far from water sources. In 2020, Highland cattle grazed significantly more within 50 meters around attractive points than in control areas (+83% on average, $p<0.001$) and compared to 2019 (+222%, $p<0.001$). Herbaceous cover around attractive points strongly decreased after grazing (-77%, $p<0.001$) compared to control areas (-39%, $p<0.001$), which resulted in increased bare soil. Simultaneously, green alder leaves were also more consumed (+23%, $p<0.001$) and branches more damaged by cattle up to 10 meters around attractive than control points due to livestock movements and scratching.

Conclusion: Altogether, our findings demonstrate the ability of Highland cattle to graze in harsh environmental conditions and to exploit green alder-encroached pastures. Furthermore, the presence of attractive points was efficient in attracting cattle toward highly encroached patches, where they successfully grazed and damaged green alders, allowing light to reach new bare soil gaps. Such results highlight the high potential of this management regime to reduce green alder encroachment in the long-term.

Take-home message: Highland cattle showed a high potential to graze in green alder-encroached pastures, enhanced by the placement of attractive points, which further increased their impact on green alder.